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BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Continue Electric Integrated Resource Planning and Related Procurement Processes	Rulemaking 20-05-003 (Filed May 7, 2020)

COMMENTS OF FORM ENERGY, INC. ON PROPOSED DECISION ADOPTING 2021 PREFERRED SYSTEM PLAN

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I. Introduction

Pursuant to Section 14.3 of the Rules of Practice and Procedure, Form Energy, Inc. ("Form Energy") respectfully submits these opening comments on Administrative Law Judge (ALJ) Julie A. Fitch's proposed *Decision Adopting 2021 Preferred System Plan* ("PD"), issued December 22, 2021.

Form Energy supports the PD's proposal to begin developing a programmatic structure for Integrated Resource Planning ("IRP") procurement in the next IRP cycle in order to better optimize for reliability, greenhouse gas (GHG) reductions, and least-cost procurement. Our comments focus primarily on objectives, actions and improvements the PD should commit to pursuing in the next IRP cycle. These recommendations include:

- develop planning standards appropriate to enable a reliable, low carbon grid by making improvements to IRP inputs, modeling tools, and modeled scenarios;

- developing and using more diverse hourly demand forecasts that reflect at least 1-in-5, 1-in-10, and 1-in-20 weather years;
- reviewing and improving renewable generation profiles to accurately capture typical and atypical weather impacts on generation;
- conducting capacity expansion modeling using scenarios of typical and atypical demand and generation;
- committing in future IRP cycles to using at least 1-in-10 demand forecasts and generation profiles in capacity expansion modeling to reflect realistic grid conditions; and
- developing new reliability metrics and planning standards to inform both long-term planning and resource adequacy.

In addition, Form Energy recommends that the Commision develop and transmit Transmission Planning Process (TPP) sensitivities to build a record about the transmission-enhancing value of multi-day energy storage. Finally, we recommend that the Commission should clarify the processes by which it plans to carry out long-term capacity expansion modeling if it forgoes a biennial RSP.

II. Develop planning standards appropriate to enable a reliable, low carbon grid by making improvements to IRP inputs, modeling tools, and modeled scenarios

Rationale for Urgent Action

Commission Decision (D.)21-06-035 requiring IRP procurement to address mid-term reliability (MTR) raised important questions about what planning standards are appropriate for IRP, what reliability metrics are most relevant, and what future resource and portfolio

performance is needed to meet reliability risks. However, D.21-06-035 did not provide satisfactory answers, instead noting the need for additional analysis and stakeholder engagement.

The need for these analyses has also been a topic of conversation in the informal Resource Adequacy Framework Reform Workshops, which were ordered by D.21-07-014 in Rulemaking (R.)19-11-009, the resource adequacy (RA) proceeding. A number of parties, including Form Energy, have indicated that they believe the IRP proceeding is a more appropriate venue in which to conduct reliability analyses and establish planning standards, given the IPR proceedings's longer time horizon and extensive analytic record to inform planning decisions.

The elimination of the requirement to develop a Reference System Plan (RSP) in 2022, as is proposed in the PD, affords an opportunity to carry out necessary analyses and make key policy determinations to improve the IRP process overall. This work is crucial to the development of a programmatic approach for IRP procurement that appropriately balances affordability, emissions reductions, and reliability.

We urge the Commission to take the following steps *before* beginning the development of programmatic procurement requirements. In order to promote coordination and make sure that the IRP and resource adequacy programs function cohesively, we recommend that the Commission conduct this work as part of the IRP proceeding, with joint notice to the resource adequacy proceeding, until the Commission decides whether IRP or RA is the preferred venue to address issues related to long-term planning standards and long-term resource adequacy.

A. Commit to developing and using more diverse hourly demand forecasts that reflect at least 1-in-5, 1-in-10, and 1-in-20 weather years

It is no longer prudent to conduct resource planning and capacity expansion modeling using a 1-in-2 demand forecast, supplemented with historic production reserve margins (PRM), to achieve a 0.1 loss of load expectation (LOLE) standard. This historical approach assumes that deviations from "average" conditions, as represented by the 1-in-2 year demand forecasts, can be accounted for with a simple percentage margin. In today's grid atypical weather magnifies reliability risks because the availability of generation is increasingly weather-dependent. Moreover, climate change is increasing both the prevalence and severity of extreme weather events. The Commission has created and been presented with sufficient analysis and real-world events to know that average conditions have not, and will not, drive reliability risks and resource needs. It is therefore critical to establish clear steps the Commission must take to ensure that it has the capability to directly plan for grid conditions that occur at least once in ten years.

The commission explained in D.21-06-035 that it cannot plan for atypical but periodically occurring weather conditions in capacity expansion planning because it relies on demand forecasts produced by the California Energy Commission (CEC), which currently only produces a 1-in-2 (average) demand forecast.

We urge the Commission to commit to collaborating with the CEC, as expeditiously as possible, to develop 1-in-5, 1-in-10, and 1-in-20 forecasts in the next Integrated Energy Policy Report (IEPR). The Commission should commit to including these demand forecasts in the next IRP cycle, if possible.

B. Review and improve renewable generation profiles to accurately capture typical and atypical weather impacts on generation

Our own analysis of the CPUC's datasets has identified significant discrepancies between the renewable energy profiles used in RESOLVE compared to SERVM and other public sources of renewable energy profiles. The PD also acknowledged the existence of discrepancies.[1] We are concerned that small discrepancies in generation shapes and capacity factors may have an outsized impact on the optimal resource portfolio in scenarios with high levels of renewables and fewer fossil-fueled resources.

We recommend that the Commission commit to refreshing the renewable energy profiles used in its capacity expansion modeling with the intent of: 1) developing realistic 8,760 generation capacity factors and shapes over typical and atypical years; 2) assessing how those shapes may change over time due to climate change (to inform decisions about what profiles should constitute typical and atypical profiles in future years); and 3) aligning the generation profiles used in capacity expansion modeling and production cost modeling.

C. Conduct capacity expansion modeling using scenarios of typical and atypical demand and generation

The cost, reliability and resource mix of future long-term portfolios is significantly impacted by the weather-year used in forecasts.[2] We recommend that, in future IRP cycles, the Commission commits to modeling scenarios that reflect both typical and atypical demand and

[1] The PD at page 103 noted that SERVM's 20-year historical average wind capacity factor is lower than RESOLVE's. This is one example; we have identified others over the entire RESOLVE and SERVM datasets, not only pertaining to capacity factors, but also to generation shapes.

[2] We use "weather years" as shorthand to refer to different hourly demand and hourly generation profiles that may occur over time. A specific year that represents average demand may not be the same year that best represents average renewable generation profiles. The same is true for atypical years: periods of high demand and low generation are not necessarily correlated.

generation. In the same way that the Commission currently models scenarios with different GHG goals, it should model how the optimal resource mix, cost, and reliability metrics change under typical versus atypical conditions.

In previous comments in this proceeding and in the resource adequacy proceeding Form has asked the Commission to characterize long-term reliability risks under long-term, low carbon, and zero carbon targets. The simplest way to do this is to directly model scenarios of atypical demand and generation at hourly resolution in capacity expansion models to reflect conditions when reliability risks are likely to materialize. It will require concerted stakeholder work to develop these scenarios to account for seasonally varying periods of extreme heat and cold, periods of low renewable energy generation, periods of fossil outages (planned or unplanned), other grid contingencies (line outages; wildfire smoke impacts on solar output), and potential correlations between these events.

D. Commit in future IRP cycles to using at least 1-in-10 demand forecasts and generation profiles in capacity expansion modeling to reflect realistic grid conditions

For the reasons noted above, we recommend that the Commission stop optimizing resource needs based on average demand and generation profiles, leveraging instead 1-in-10 year forecasts, as soon as possible. If the Commission takes this guidance it may also need to review and revise what PRM is reasonable. In the course of this assessment, the Commission should reconsider what set of reliability metrics, beyond a 0.1 LOLE, best reflect prudent reliability. The historic 15% PRM was intended as a crude, simplifying mechanism to arrive at a 0.1 LOLE reliability standard by building a cushion of excess capacity into the grid. The Commission's

more recent drive to temporarily increase the target PRM to 22.5% to address urgent reliability risks was equally crude, but reasonable at the time given the urgent circumstances.

There are four simple reasons to take this advice: 1) climate change is causing atypical weather events to become increasingly typical and is driving extreme weather events that are impactful enough to warrant being planned for directly; and 2) it is computationally feasible to directly optimize resources needs based on hourly 1-in-10 profiles of demand and generation; 3) there is no longer a reasonable basis to plan future resource needs based on historic average years; 4) planning for atypical grid conditions when doing resource planning will save costs in the long run.[3]

This approach has an additional benefit: it can bring capacity expansion modeling and production cost modeling (PCM) into closer alignment. The Commission has experienced several instances in recent years when its RSP portfolio has proven unreliable when run through a reliability check, such that the Commission has had to directly add capacity until the portfolio is reliable. We submitted informal comments to the Modeling Advisory Group on July 19, 2019, highlighting two likely causes of such outcomes: the fact that capacity expansion modeling uses sample days and typical years, whereas PCM models capture the grid's full 8,760 hourly operations under a range of statistically weighted futures.

In a world in which both demand and generation are increasingly variable and weather-dependent, and in which traditional sources of firm capacity are retiring and being

[3] Form Energy's white paper on Best Practice Modeling to Achieve Low Carbon Grids highlights that portfolios planned using typical years can be significantly more expensive in effect when operated under real world conditions not captured in capacity expansion modeling. Customers ultimately bear that avoidable cost.

replaced by energy storage, it is increasingly urgent to optimize future resource needs for atypical (but reasonably likely) grid conditions.

E. Develop new reliability metrics and planning standards to inform both long-term planning and resource adequacy

Capacity expansion planning using 1-in-10 demand and generation profiles may still not guarantee that load will be served in all hours; therefore, it is likely that a PRM will continue to be needed. We recommend that the Commission pursue an analytically-based method to define a reasonable PRM that can capture additional sources of uncertainty (e.g. more extreme weather than modeled (e.g. 1-in-20 years); unplanned resource outages; wildfire impacts; etc.).

To support this effort, we also recommend that the Commission refer to work being done by organizations like the Energy Systems Integration Group (ESIG). Their report, Redefining Resource Adequacy for Modern Power Systems,[4] is broadly relevant to long-term resource planning and long-term resource sufficiency studies, and it points to analytical approaches to evaluate the characteristics of events that cause resource adequacy risks (shape, magnitude, duration, frequency), which should become a standard aspect of IRP modeling.

We are encouraged to see the Commission publish information about a broader range of reliability metrics in the Preferred System Plan, including unserved energy and loss of load hours, and we recommend that the Commission commit to taking additional steps in the next IRP cycle to align long-term planning with long-term reliability. We do not believe the resource adequacy proceeding has sufficient analysis or a sufficiently long view of both future resource needs and future reliability risks to inform the development reliability standards appropriate for

[4] See ESIG, Redefining Resource Adequacy for Modern Power Systems, 2021.

the long-run. We therefore recommend that the Commission clarify and commit to relying on IRP to establish long-run planning and reliability standards.

III. The Commission should commit to developing a programmatic approach to procurement that is transparent, analytics-based, and supportive of long-term reliability

Form Energy supports the PD's commitment to develop a programmatic approach to IRP procurement. We agree that a well-designed programmatic approach to procurement can improve the predictability of procurement orders; align reliability, least cost, and GHG reductions goals; and create stable market conditions that increase resource diversity.

Proposed additions to programmatic procurement objectives

In order to unlock these benefits, the program must be built around a number of key objectives. While the PD outlines an initial set of objectives, it should clarify in the discussion beginning on p. 150 that a durable programmatic approach is one that also:

- Establishes an explicit process for updating inputs and assumptions
- Establishes a direct pathway by which newly developed locational analysis informs procurement orders to:
    - Develop non-emitting resources that enable the orderly retirement of natural gas storage and generation facilities without compromising reliability; and
    - Deploy energy storage resources to enhance the value of the transmission system
- Identifies long-term need for emerging resources and directs early procurement of resource classes with long-term benefits in order to support commercialization

- Establishes incentives, programs or other procurement-related measures to address barriers to market for emerging technologies that have the potential provide significant long-term benefits;
- Establishes methods to quantify the value that resources may provide that are not reflected in existing programs, procurement valuation methods, or markets (e.g. the grid reliability, resilience, and transmission-enhancing value of multi-day energy storage).

IV. Recommended Transmission Planning Process (TPP) sensitivities to build a record about the transmission-enhancing value of multi-day energy storage

In future IRP cycles, we recommend that the Commission develop and transmit multiple TPP sensitivity portfolios to the California Independent System Operator (CAISO) so that the Commission can develop an understanding of the transmission-enhancing value of energy storage. Neither the Commission nor CAISO has developed information about the value that multi-day energy storage can provide to the transmission system by increasing the utilization of existing and planned transmission assets.

One way to develop an understanding of these benefits is to submit TPP sensitivities that include different amounts of multi-day energy storage and different energy storage resource attributes and to assess how the transmission needs change. This is a nascent area of analysis that warrants near-term analytic investment, given the quantity of renewables and transmission California will need to build, as well as growing concerns about economic curtailment and land use impacts. Form Energy recently completed a study in partnership with National Grid ESO, the United Kingdom's grid operator, of how different forms of multi-day energy storage can support

congested grids.[5] This study is not the same as CAISO's TPP, but the approach and findings can inform how the Commission could construct sensitivities.

V. The Commission should clarify the processes by which it plans to carry out long-term capacity expansion modeling if it foregoes a biennial RSP

Form Energy supports with a caveat the Commission's intention to consider a RSP intermittently: it should only forgo RSP modeling if the Commission commits to conducting long-term capacity expansion modeling on a regular basis as part of the programmatic procurement framework. We hope that, by eliminating the 2022 RSP, the Commission will have an opportunity to improve the IRP process and modeling methods and to conduct additional urgent analysis. However, it is essential for the Commission to conduct regular long-term capacity expansion modeling to provide the basis to inform both policy and procurement decisions that will continue to arise.

In addition, the Commission should specify a procedural pathway by which parties may present relevant new information and request that the Commission adopt an updated RSP without the need to file a PFM. Form Energy believes that a motion in the IPR proceeding open at the time of filing would serve as an appropriate venue.

VI. Conclusion

Form Energy appreciates the opportunity to submit these comments and looks forward to continuing to work with the Commission and parties on these important issues.

Respectfully submitted,

[5] *See* Form Energy, Energy Storage to Support the UK Transmission Grid, October 27, 2021

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